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SYLLABLE STRUCTURE OF UKRAINIAN. AN OT PERSPECTIVE

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ABSTRACT

This paper aims at presenting an OT account of the basic syllable structure of Ukrainian. Among the specifically Ukrainian syllable-driven processes that are considered are onset maximisation, prothesis, voice assimilation, as well as the behaviour of clusters of obstruents agreeing and disagreeing in voicing, sonority plateaus and extrasyllabic sonorants. Optimality Theory is shown to successfully handle dialectal variation in the application of prothesis, as well as the transparency effects in voice assimilation.

KEYWORDS: Phonology; syllable; Ukrainian; prothesis; extrasyllabicity.

1. Background[*]

The data are analysed in the Optimality Theory (OT henceforth) framework as outlined in Prince and Smolensky (1993), McCarthy and Prince (1993a), McCarthy and Prince (1993b) and others. This paper is structured as follows. We set out by providing theoretical background and basic facts about syllable structure in Ukrainian. Next, prothesis is shown not to operate any longer in Standard Ukrainian (Section 2.1), the process is still productive in certain dialects (Section 2.2). The factorial typology shown by the two dialects is expressed in OT as the reranking of two universal constraints. In Section 3.1, we deal with obstruent clusters. Clusters of obstruents that disagree in voicing deserve a separate account in Section 3.2. Section 4.1 addresses the issue of the syllabification of consonantal sonorants. More specifically, sonority plateaus are investigated in Section 4.2. The different behaviour of word-initial and word-final extrasyllabic sonorants with respect to voice assimilation points to their different syllable affiliation in Section 4.3. We conclude the analysis in Section 5.

[*] I would like to thank the anonymous *PSiCL* reviewers for their discussion and criticism.

First, let us look at some constraints that are responsible for erecting basic syllable structure (Prince and Smolensky 1993).

(1a) Harmonic Nucleus (H_{Nuc}): Most harmonic (that is most sonorous) segments are syllable peaks.
(1b) Onset (Ons): Syllables must have onsets.
(1c) NoCoda: Syllables may not have codas.
(1d) No Complex Onset (NoComplOns): Onsets cannot be complex.
(1e) No Complex Coda (NoComplCoda): Codas cannot be complex.

Input-output faithfulness constraints are necessary to prevent unrestricted optimisation of the syllable structure at the cost of deletion or insertion of segments.

(2) Dep_{Seg}: Every segment of the input has a correspondent in the output. (Prohibits phonological deletion.)

(3) Max_{Seg}: Every segment of the output has a correspondent in the input. (Prohibits phonological epenthesis.)

At the outset of the analysis, it is useful to determine the status of the constraints presented so far. In Ukrainian only vowels are syllabic, which implies a ban on syllabic consonants incorporated in H_{Nuc} in (1a). The ranking of Onset (1b) with respect to the faithfulness constraints in (2) and (3) can be determined by looking at onsetless syllables (the data here and below are taken from Rusanovskij et al. 1986).

(4a) *maestro* [aɛ] ‘maestro’, *xoany* [ɔa] ‘nasal passage’, *pean* [ɛa] ‘paean’
(4b) *ity* [i] ‘go’, *um* [u] ‘mind’
(4c) *ja* [ja]‘I’, *vaš* [ʊa] ‘your’

The presence of vowel hiatus in (4a) and initial onsetless syllables in (4b) indicate that Onset is dominated by Max_{Seg} and Dep_{Seg} (among others). In other words, deletion and insertion are not used to provide missing onsets in Standard Ukrainian (dialectal prothesis is discussed below). Additionally, the data in (4c) show initial syllables with onsets. The high frequency of such syllables in Ukrainian is not surprising as they are universally unmarked.

(5) Max_{Seg}, Dep_{Seg} >> Ons

In contrast to non-branching onsets, branching (complex) onsets are typologically marked. Along with word-final codas they are extremely common in the language. A sample of such words is offered in (6) (Perebyjnis 1970).

(6a) *mrec'* [mr] 'corpse', *brat* [br] 'brother', *krasa* [kr] 'beauty'
(6b) *bab* [b] 'old lady' (gen.pl.), *dum* [m] 'thought' (gen.pl.), *sik* [k] 'juice'

We conclude that NoComplOns and NoCoda are dominated by faithfulness constraints. Looking at word-initial complex onsets and word-final codas is not very revealing as to the interaction of NoComplOns and NoCoda. Let us consider word-medial consonant clusters where such an interaction is bound to occur (syllable boundaries are indicated by a dot). The data and syllabification principles here and below are based on Toc'ka (1981). My fieldwork confirms Toc'ka's findings.

(7) *l'u.bl'u* 'love' (1st p.sg.), *za.bju* 'hurt' (1st p.sg.), *mu.dryj* 'wise'

Onsets are maximised, which entails the ranking of NoCoda above NoComplOns as shown in the evaluation of *l'ubl'u*.

(8) Input: //l'ubl'+u/[1]

	NoCoda	NoComplOns
☞ (a) l'ubl'+u		*
(b) l'ubl'+u	*!	

To complete the discussion of basic syllable structure, it remains to determine the status of NoCompCoda. The words in (9) contain word-final complex codas.

(9) *firm* [rm] 'firm' (gen.pl.), *koktejl* [jl'] 'cocktail', *šajb* [jb] 'puck' (gen.pl.), *bul'b* [l'b] 'tuber' (gen.pl.), *rejs* [js] 'trip', *tal'k* [l'k] 'talc'

In the face of the commonness of complex codas in the language, we conclude that NoComplCoda is not undominated.

2. Prothesis

We now turn to analyse more specific processes that make reference to the notion of the syllable. Section 2 discusses prothesis in Standard Ukrainian and south-western dialects. Although both dialects show traces of prothesis, whether it is productive is a totally different matter.

[1] The root-final /l'/ is not underlying but inserted, *l'ubyty* (inf.).

2.1. Prothesis in Standard Ukrainian

The data below are compiled on the basis of Žovtobrjux et al. (1972: 146–7) and Ševelov (1979).

(10) Prothesis: Standard Ukrainian

(10a) [ʊ] *ʊulyc'a* 'street', *ʊuxo* 'ear', *ʊulyk* 'beehive', *ʊona* 'she', *ʊohon'* 'fire'
(10b) [ʊ'] *ʊin* 'he', *ʊid* 'from', *ʊivc'a* 'sheep', *ʊikno* 'window'
(10c) [ɦ] *ɦarbuz* 'watermelon', *ɦorix* 'nut', *ɦostryj* 'sharp'
(10d) – *ity* 'go', *imja* 'name', *inšyj* 'different'

On the basis of the words corresponding to (10a) in Polish (*ulica*, *ucho*, *ul*, *ona*, *ogień*) and Russian (*ulica*, *uxo*, *ulej*, *ona*, *ogon'*), we are led to conclude that the Ukrainian data show prothesis. Moreover, prothesis applies before rounded vowels /u/ and /ɔ/. The prothetic segment is the bilabial approximant /ʊ/ (this segment exhibits considerable variation throughout Ukraine and can also be realized as a labio-dental approximant or a labio-dental fricative, see Rusanovskij et al. 1986: 18–9, Ziłyn'ski 1932: 52–6). The choice of the prothetic segment makes sense if we consider the historical fact that /ʊ/ originates from the bilabial glide /w/. Thus, the rule of prothesis can be said to effect the insertion of a rounded glide before a rounded vowel with a later change of the glide into an approximant.

The words in (10b) also show prothesis, but they seem to contradict the generalization formulated in the discussion of the data in (10a). This is only apparently so. Even though ʊ-prothesis applies before an unrounded vowel, the vowel /i/ in these words can be traced back to the historical rounded /ɔ/; cf. Polish *on, od, owca, okno* and Russian *on, od, ovca, okno*. Modern alternations in related words testify further to this historical change, for instance *vin* 'he' vs. *vona* 'she'. The process of prothesis applies at an earlier stage when the initial vowel is /ɔ/ in (10b), the vowel is later unrounded and raised to /i/ under specific stress conditions (see Žovtobrjux et al. 1972). Finally, the prothetic segment is palatalised before /i/, resulting in [ʊ'].

A different prothetic segment is also attested in Ukrainian, as shown by the occurrence of the voiced glottal fricative /ɦ/[2] in (10c); cf. Polish *arbuz*, *orzech*, *ostry* and Russian *arbuz*, *orex*, *ostryj*. This prothetic segment appears before vowels /a/ and /ɔ/, the latter context is problematic for the ʊ-prothesis formulated for the data in (10a). What is more, words in (10d) show that prothesis is not obligatory and that the original (historical) high front vowel /i/ in word-initial position is not necessarily accompanied by a prothetic segment.

[2] The classification of /ɦ/ and other glottals as consonants is controversial, see, for instance, Clements (1985) and Clements and Hume (1995). The status of /ɦ/ is not central in this analysis.

The data in (10c–d) obliterate the picture of prothesis in modern Standard Ukrainian. Not only is it not universal in its application to word-initial onsetless syllables, the choice of prothetic segments is largely unpredictable, for instance *vohon'* vs. *horix*. The words in (10d) might suggest that only original (historical) /i/ escapes prothesis; we need not look very far to falsify this thesis.

(11) Standard Ukrainian

(11a) *armija* 'army', *artyst* 'artist'
(11b) *elevator* 'elevator', *etan* 'dimethyl'
(11c) *oko* 'eye', *orel* 'eagle'

Not only are word-initial unrounded vowels attested (11a–b), prothesis fails to apply before the rounded vowel /ɔ/ in (11c). We must conclude that prothesis is no longer productive in Standard Ukrainian, it can only be perceived as a historical process.

The ranking of Onset and the two faithfulness constraints Max_{Seg} and Dep_{Seg} must allow for onsetless syllables, as in the evaluation of *elevator*.

(12) Standard Ukrainian, no prothesis
Input: //ɛlɛʋatɔr//

	Max_{Seg}	Dep_{Seg}	Ons
☞ (a) ɛlɛʋatɔr			*
(b) ɦɛlɛʋatɔr		*!	
(c) lɛʋatɔr	*!		

Onset is lower-ranked than both Max_{Seg} and Dep_{Seg}, as neither word-initial deletion nor insertion is used in a productive way. As a consequence, historical prothetic segments must be included in the lexicon. The words in (10a–c) contain the initial consonants in their input representations, for example //ʋuxɔ//, //ʋin//, //ɦarbuz//, etc.[3]

2.2. Prothesis in south-western dialects of Ukrainian

Let us now turn to south-western dialects of Ukrainian and consider words that correspond to the Standard Ukrainian words in (11) (based on Žovtobrjux et al. 1972).

[3] On the assumption of the Richness of the Base, the discussion centred around the input representations is meaningless. Whether the prothetic segments are present in the input or not is irrelevant.

The underlying segments for [ʋ] and [ɦ] could as well be //w// and //ɣ// (voiced velar fricative). The choice lies outside the scope of this paper, but see Czaplicki (2006).

(13) South-western dialects of Ukrainian

(13a) *harmija* 'army', *hartyst* 'artist'
(13b) *helevator* 'elevator', *hetan* 'dimethyl'
(13c) *hoko* 'eye', *horel* 'eagle'

The data show that dialectally prothesis is a uniform process that applies to all words (including recent borrowings) with initial onsetless syllables.[4] For an evaluation of *elevator* to be exhaustive, an alignment constraint referring to the left edge of the word needs to be incorporated.

(14) Align-L(stem,σ): Align the left edge of the stem with the left edge of the syllable.

Align-L is violated whenever a word-initial segment is deleted or a segment is inserted at the beginning of a word (prothesis).

(15) Input: //ɛlɛʋatɔr//

	Max_{Seg}	Ons	Align-L(stem,σ)	Dep_{Seg}
☞ (a) ɦɛlɛʋatɔr			*	*
(b) ɛlɛʋatɔr		*!		
(c) lɛʋatɔr	*!		*	

For prothesis to take effect in (15), segment deletion is prohibited by a high-ranking Max_{Seg} and, at the same time, insertion must be induced by ranking Onset higher than both Align-L and Dep_{Seg}. The winning candidate with prothesis violates the low-ranked Align-L and Dep_{Seg}. The faithful candidate (b) incurs a fatal violation of Onset. Deletion in candidate (c) is penalised by the high-ranking Max_{Seg}. Needless to say, prothetic segments are not present in the input forms in these dialects.

We conclude that the crucial difference in the treatment of initial onsetless syllables in Standard Ukrainian and south-western dialects lies in the ranking of Dep_{Seg} and Onset. In Standard Ukrainian the former is ranked higher than the latter. In contrast, south western dialects are characterized by the reverse ranking. Additionally, Align-L is dominated by Ons in south-western dialects. This particular ranking of Align-L need not be the case in Standard Ukrainian.

[4] As regards the choice of the prothetic segment, there is considerable dialectal variation. Some dialects employ [ɦ], some [ʋ], still some others [j], see Žovtobrjux et al. (1972).

3. Clusters of obstruents

Up to this point we discussed configurations of consonants in onsets and codas which observe Sonority Sequencing Generalisation (SSG) (Selkirk 1984).

(16) SSG: The sonority of segments must decrease towards the edges of the syllable.

In the subsequent sections we concentrate on sequences of consonants that are incompatible with SSG. Let us begin with clusters of obstruents.

3.1. Clusters of obstruents with the same [voice] specification

In the data below O stands for obstruent, V for vowel and # for word boundary.

(17) #OOV *ptax* [pt] 'bird, *dbaty* [db] 'care', *sxema* [sx] 'scheme',
zhaha [zɦ] 'heartburn', *spaty* [sp] 'sleep', *ždaty* [žd] 'wait',
pxaty [px] 'push', *bdžola* [bdž] 'bee', *džhut* [džɦ] 'jute'

The data exemplify extremely common clusters of two obstruents in word-initial onsets. Moreover, the two obstruents may appear virtually in any configuration: stop + stop, fricative + fricative, fricative + stop, stop + fricative, etc. To support this observation, we quote the findings of Sawicka's research, which focuses on possible consonant clusters. Sawicka shows that fricatives /s/ and /z/ can combine with as many as 7 other obstruents (for instance, /s/ appears in the following clusters: [sp], [sf], [st], [sts], [ss], [sk], [sx]). Other obstruents do not lag far behind, for example, /š/, /ž/ and /p/ co-occur with 6, /k/ with 5 and /s'/ with 4 obstruents (Sawicka 1974: 52). We conclude that any two obstruents can combine in either order. Translated into the OT framework, faithfulness constraints override SSG in the class of obstruents (it is important to note that not all configurations of obstruents are penalised by SSG, for instance, stop + fricative).

(18) Input: //spa+t+ɪ//

	Max_{Seg}	Dep_{Seg}	SSG	NoCoda	NoComplOns
☞ (a) spa.tɪ			*		*
(b) pa.tɪ	*!				
(c) sə.pa.tɪ		*!			

The evaluation of *spaty* in (18) shows both Max_{Seg} and Dep_{Seg} crucially ranked above SSG. The optimal candidate observes the faithfulness constraints at the cost of a violation of SSG. It is worthwhile to see how clusters of two obstruents are syllabified word-medially (Toc'ka 1981: 134–5).

(19) VOOV *mi.sto* ‘city’, *vo.skovyj* ‘waxen’, *di.ždatys’a* ‘wait’

Word-medial clusters of obstruents offer an option of splitting the cluster between two adjacent syllables, thus escaping a violation of SSG. This option is not entertained in Ukrainian; instead the entire cluster appears in the onset incurring a violation of SSG. It is, therefore, warranted to postulate a high-ranking ObsOns constraint.

(20) ObsOns:Obstruents must be in the onset.[5]

ObsOns will not take any effect unless it is ranked above SSG, as shown in the evaluation of *misto* in (21).

(21) Input: //mist+ɔ//

	ObsOns	SSG	NoCoda	NoComplOns
☞ (a) m’i.stɔ		*		*
(b) m’is.tɔ	*!		*	

NoComplOns must also be ranked below ObsOns. Ukrainian shows a tendency to maximise onsets made up of obstruents at the cost of a violation of SSG. Let us turn to cases involving three intervocalic consonants and see whether a parallel can be drawn with the words containing clusters of one fewer consonant, discussed above.

(22) *po.stril* [str’]‘shot’, *ho.stryj* [str] ‘sharp’, *za.zdrošči* [zdr] ‘envy’ (3rd p.sg.)

Words in (22) show an obstruent at the beginning of a three-consonant cluster. In spite of a violation of SSG, the onset is maximised. This follows from the previously established high ranking of ObsOns.

[5] An anonymous reviewer rightly points out that the formulation in (20) cannot be maintained cross-linguistically. Obstruent clusters do not function as a homogeneous class, rather, there is a plausible grounding to posit a ranking of constraints referring to *particular* obstruents as SSG-violators. One such constraint must refer to /s/, which seems to be the commonest SSG-violator among obstruents, especially in the /s/+stop combination (see, for instance, Selkirk 1982; Broselow 1991; Steriade 1994; Rubach 1997a; and Morelli 1999). As Ukrainian does not seem to differentiate between specific obstruents with respect to syllabification, the simplified ObsOns constraint in (20) is sufficient for our purposes. More generally, however, ObsOns comprises a hierarchy of specific constraints (/s/ must be in the onset, /z/ must be in the onset, /t/ must be in the onset, etc.) whose ranking happens to be irrelevant in Ukrainian.

(23) Input: //pɔstril//

	ObsOns	SSG	NoCoda	NoComplCoda	NoComplOns
☞ (a) pɔ.str'il		*	*		**
(a) pɔs.tr'il	*!		**		*
(a) pɔst.r'il	*!*		**	*	
(a) pɔstr'.il	*!**	*	**	**	

In the evaluation of *postril*, the optimal candidate is the only one of the lot to satisfy ObsOns. The cost is a violation of the lower-ranked SSG. The ranking established in tableau (21) is further supported.

It remains to be seen whether ranking ObsOns above SSG has any effect on word-final complex codas. Complex codas containing clusters of obstruents are far from rare in Ukrainian and, in parallel to complex onsets, there are no apparent restrictions on the possible configurations.

(24) VOO# *tak<u>t</u>* [kt] 'tact', *pa<u>kt</u>* [kt] 'pact', *bly<u>sk</u>* [sk]'shine',
ma<u>tč</u> [tč] 'match', *kode<u>ks</u>* [ks] 'code', *hvo<u>ždž</u>* [ždž] 'beat' (imp.)

As in the case of word-initial complex onsets in (18), the relevance of Max_{Seg} and Dep_{Seg} comes to light in the evaluation of *takt*.

(25) Input: //takt//

	Max_{Seg}	Dep_{Seg}	ObsOns	SSG	NoCoda	NoComplOns
☞ (a) takt			**	*	*	
(b) tak	*!				*	
(c) ta.ktə		*!		*		*

The correct output is selected as long as the faithfulness constraints dominate ObsOns. Here, escaping a violation of ObsOns (and SSG) would entail insertion or deletion, as the option of splitting the cluster otherwise is not available.

3.2. Clusters of obstruents with the opposite [voice] specification

Ukrainian is characterised as not having regressive devoicing of obstruents (Bethin 1987).

(26) *kaz.ka* 'fairy-tale', *hrud.ka* 'clod', *vez.ty* 'drive'

As shown in (26), obstruent clusters which disagree in [voice] are split (Toc'ka 1981: 134 and my own fieldwork), which implies the operation of Voice Constraint, going back to Jespersen (1904).

(27) Voice Constraint (VC): A voiced segment cannot be further away from the nucleus than a voiceless segment.

To put it in other words, a voiceless segment must not intervene between a voiced segment and the nucleus.[6] The evaluation of *kazka* proceeds as expected as long as VC is not dominated by ObsOns.

(28) Input: //kaz+k+a//[7]

	VC	ObsOns	SSG	NoCoda	NoComplOns
☞ (a) kaz.ka		*		*	
(b) ka.zka	*!		*		*

It is noteworthy that word-initial sequences of obstruents disagreeing in [voice] (*[zt-], *[džk-], etc.) are unattested in Ukrainian. Such clusters could not escape a violation of VC, as there is no possibility to separate the two obstruents. Ukrainian syllabification of clusters disagreeing in voicing and the lack of such clusters in onsets support the cross-linguistic universality of VC.

4. Sonorants

Having analysed SSG-violators in the class of obstruents, let us turn to consonantal sonorants to determine whether their behaviour calls for a similar SSG suspension. First we consider word-medial clusters of consonants at least one of which is a sonorant. Following that is a section devoted to combinations of sonorants of the same sonority (sonority plateaus). Finally, we look at SSG-violating sonorants at word-margins. As the sonorants in question do not have an alternative syllable to attach to, as is the case with word-medial clusters, they remain extrasyllabic.

4.1. Word-medial clusters

In (29) intervocalic consonant clusters of decreasing sonority are shown. At least the first consonant of each cluster is a sonorant.

[6] Although it is possible to modify SSG in a way that makes VC redundant (see Selkirk 1984), for reasons of exposition, we present a separate VC.

[7] Here and below yers are disregarded in the underlying representation.

(29) VCCV *syn.ku* ‘sonny’ (voc.sg.), *haj.ka* ‘screw-nut’, *har.nyj* ‘nice’

Looking at the data in (29), where such clusters are heterosyllabic, we conclude that SSG takes precedence over onset maximisation. In other words, a constraint parallel to ObsOns that would refer to sonorants is either not ranked high enough to have any visible effect or is not a universal constraint at all.

(30) Input: //sɨn+k+u//

	ObsOns	SSG	NoCoda	NoComplOns
☞ (a) sɨn.ku			*	
(b) sɨ.nku		*!		*

The correct output is selected provided that SSG is ranked above NoCoda. Needless to say, ObsOns is mute in the evaluation. It is useful to see whether this ranking can be maintained when three-consonant clusters are examined.

(31) *kar.tka* [rtk] ‘sheet’, *žytej.s’kyj* [js’k] ‘practical’, *sil’.s’kyj* [l’s’k] ‘idyllic’

Words in (31) exhibit a sonorant in the initial position of a cluster. As expected, the sonorant surfaces in the coda of the previous syllable.

(32) Input: //kart+k+a//

	ObsOns	SSG	NoCoda	NoComplCoda	NoComplOns
☞ (a) kar.tka		*	*		*
(b) ka.rtka		**!			**
(c) kart.ka	*!		*	*	
(d) kartk.a	*!*	**	*	**	

In tableau (32), the sonorant /r/ is not protected in the onset by a constraint parallel to ObsOns in (23). The main contender, candidate (b), loses on SSG, since it incurs one more violation than the winning candidate (notice that in both candidates a violation of SSG by /t/ is unavoidable). The remaining candidates are eliminated because the obstuents appear in the coda, thus undermining onset maximisation.

4.2. Sonority plateaus

We now address the issue of sonority plateaus. Clusters made up of sonorants of equal sonority demand special attention because the violation of SSG might be seen as less

serious than one incurred by clusters with increasing sonority towards syllable margins. Sonority plateaus at word margins are exemplified in (33).

(33a) *množyna* [mn] ‘multitude’, *l’l’anyj* [l’ː] ‘flaxy’
(33b) *himn* [mn] ‘hymn’, *horl* ‘throat’ (gen.pl.)

The data in (33a) exhibit word-initial onsets and the data in (33b) word-final codas. The occurrence of such clusters is in accordance with the observation held so far that neither deletion nor insertion of segments can justify a violation of SSG in Standard Ukrainian.

(34) Input: //mnɔžɬn+a//

	Max_{Seg}	Dep_{Seg}	SSG	NoCoda
☞ (a) mnɔ.žɬ.na			*	
(b) nɔ.žɬ.na	*!			
(c) əm.nɔ.žɬ.na		*!		*

The evaluation of *množyna* proceeds as expected as long as Max_{Seg} and Dep_{Seg} dominate SSG. The data in (35) exhibit the syllabification of sonority plateaus inside words.

(35) *sum.nyj* [mn] ‘sad’, *hor.lo* [rl] ‘throat’

Word-medially faithfulness constraints, such as Max_{Seg} and Dep_{Seg} need not be violated in a strategy to satisfy SSG. The cluster may be split between the adjacent syllables. Ukrainian entertains this option, as shown in (35). In the evaluation of *sumnyj* the two faithfulness constraints do not play a significant role in eliminating the main contender.

(36) Input: //sum+nɬj//

	Max_{Seg}	Dep_{Seg}	SSG	NoCoda
☞ (a) sum.nɬj				*
(b) su.nɬj	*!			
(c) su.mə.nɬj		*!		
(d) su.mnɬj			*!	

Candidate (d) with the /mn/ cluster in the onset incurs a fatal violation of SSG. In contrast, the optimal candidate satisfies SSG but fares badly on NoCoda, as a result of the separation of the cluster. Tableau (36) supports the ranking of SSG above NoCoda established for *synku* in (30). It follows that sonority plateaus made up of sonorants are treated like any other clusters (other than obstruent clusters) violating SSG. A special caveat for such clusters of equal sonority would be unmotivated in Ukrainian.

4.3. Extrasyllabic sonorants

Having analysed the behaviour of word-medial sonorants in 4.1, we now turn to (extrasyllabic) sonorants which violate SSG at word edges (the data taken from Rusanovskij et al. 1986).

(37a) *rdesnyk* [rd] 'smartweed', *rtut'* [rt] 'mercury', *ln'anyj* [l'n'] 'flaxy'
(37b) *perymetr* [tr] 'perimeter', *kehl'* [ɣl'] 'font size'
(37c) *msta* [mst] 'revenge', *Mstyslav* [mst] first name
(37d) *iskr* [skr] 'sparkle' (gen.pl.), *l'udstv* [dstʊ] 'mankind' (gen.pl.)

In (37a) word-initial sonorants followed by a segment of lower sonority (obstruent or another sonorant) illustrate onset SSG-violators. Parallel SSG-violators in the coda are exemplified in (37b). The remaining data show clusters of 3 or 4 consonants that contain a sonorant violating the SSG in onsets (37c) and codas (37d).[8] It is worthwhile to mention that words with extrasyllabic sonorants are present in the language but they cannot be counted among the most common clusters. Specifically, combinations of obstruents and sonorants in syllable constituents that observe SSG show significantly higher frequency. To give an idea how important a role SSG plays in designating possible onsets, let us refer to Sawicka's study. As far as the attested combinations involving [l'] are concerned, she lists only one that violates SSG [l'n'], compared with as many as thirteen combinations that comply with the constraint (Sawicka 1974: 52).[9]

(38) [ml'], [ʊl'], [pl'], [bl'], [fl'], [tl'], [dl'], [s'l'], [z'l'], [šl'], [kl'], [xl'], [ɦl']

To determine the syllable affiliation of extrasyllabic sonorants in (37), we inspect the operation of voice assimilation across word boundaries. It is generally claimed that Standard Ukrainian does not show devoicing of obstruents, only voicing (Bethin 1987, after Bulaxovs'kyj 1951; Braxnov 1970)[10].

(39a) *hryb* [b] 'mushroom', *vaz* [z] 'vase' gen.pl., *plid* [d] 'fruit'
(39b) *dužka* [žk] 'handle', *vezty* [zt] 'drive', *xobta* [bt] 'trunk' gen.sg.
(39c) *pros'ba* [z'b] 'request', *borot'ba* [d'b], *vokzal* [gz] 'station'
(39d) *xoč by* [dž b] 'if only', *ot že* [d ž] 'therefore'

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[8] The consonant /ʊ/ is a sonorant in Standard Ukrainian.

[9] It is interesting to mention that most of the SSG violations in (36) result historically from the loss of yers, for instance, [ržat'] ← /rʏzat'/, [rtut'] ← /rʏtutʊ/ (Rusanovskij et al. 1986: 31)

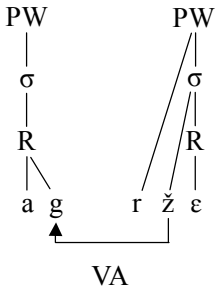
[10] Bethin (1987), after Braxnov (1970), limits devoicing of obstruents to asyllabic prepositions and prefixes (*z*, *z*-), and optionally to syllabic prefixes (*bez*-) and the fricative /h/ (*nihot'* [nifiot'] → *nihti* [nixt'i ~ niɣt'i] 'nail, nails').

The data in (39a, b) show the lack of final devoicing and regressive devoicing of obstruents. Voicing, as the only voice assimilation process in Ukrainian, is exemplified in (39c). It is useful to look at extrasyllabic sonorants and see whether they have an impact on voice assimilation.

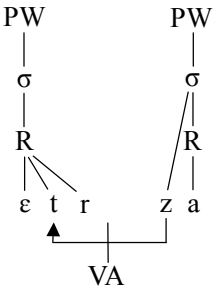
(40a) *syvak rže* [g rž] 'grey horse neighs'
(40b) *perymetr zaxidnyj* [tr z] 'western perimeter'

In (40a) voice assimilation proceeds as expected, in spite of an intervening sonorant. In contrast, the extrasyllabic sonorant in (40b) has a blocking effect on voicing. We conclude that extrasyllabic sonorants in the onset are transparent to voice assimilation, as opposed to those appearing in the coda. This observation warrants the claim about their different affiliation in the syllable. For compactness, only the relevant strings of *syvak rže* (41a) and *perymetr zaxidnyj* (41b) are represented (VA stands for voice assimilation, PW for Phonological Word).

(41) (a)



(b)



Transparency to voice assimilation in (41a) is facilitated by the adjunction of the extrasyllabic sonorant directly under the PW node, thus eliminating it from the scope of the syllable. The opacity of the coda sonorant in (41b) is achieved by the regular adjunction under the syllable node (the Rhyme node, to be more specific). This analysis of extrasyllabic sonorants is a derivative of Rubach and Booij (1990) and Rubach (1996). An assumption about voice assimilation must be made: its locus of application is the syllable tier, not the PW tier. In other words, voice assimilation establishes adjacency on the syllable tier and segments linked directly under the PW node are invisible.[11]

The adjunction of the sonorant under the syllable node in (41b) entails a violation of SSG, as the constraint operates within the syllable. The representation in (41a), on the other hand, fares well on SSG, as the extrasyllabic sonorant is outside of its scope. However, a violation of a different type of constraint is bound to arise.

[11] Following Rubach (1997b), we could also assume that sonorants linked directly under the PW node lack the Laryngeal node. Given that voice assimilation establishes adjacency on the Laryngeal tier, such sonorants are transparent.

(42) Strict Layer (SL): Segments must be grouped into syllables, syllables into feet, feet into phonological words, and so forth (Nespor and Vogel 1986).[12]

Any candidate containing segments that skip a prosodic tier incurs a violation of SL. Specifically, this constraint militates against the adjunction of a segment directly under the PW node, without the intermediary of the syllable node (41a). Additionally, we need to consider the ranking of two alignment constraints: one referring to the right edge, the other to the left edge of the word.

(43a) Align-R(stem,σ): Align the right edge of the stem with the right edge of the syllable.
(43b) Align-L(stem,σ): Align the left edge of the stem with the left edge of the syllable.

These two constraints are employed in the evaluations of *rže* and *perymetr*. In the tableau showing *rže*, the sonorant in question links to the PW node, skipping a level. The relevant alignment constraint is Align-L. (See (44) overleaf.)

Two candidates that involve deletion and insertion are included in (44). These are eliminated by the high-ranked Max_{Seg} (candidate c) and Dep_{Seg} (candidate d). The two faithful candidates are assessed by SSG, SL, and Align-L. The runner-up (candidate b) violates SSG and the winning candidate fares badly on SL and Align-L, which leads us to conclude that SSG dominates both SL and Align-L.

An analysis of *perymetr* incorporates Align-R because here the right edge of the word is examined. Additionally, ObsOns is considered. (See (45) on page xxx.)

Like in (44), in the evaluation of *perymetr* the unfaithful candidates (c, d) are eliminated by Max_{Seg} and Dep_{Seg}. A violation of SSG arises in the winning candidate. Candidate b, on the other hand, fares badly on SL and Align-R. Since the former constraint must be ranked lower than SSG, as shown in (44), the decision is passed on to Align-R. By ranking Align-R above SSG the correct output is selected. ObsOns does not interfere with the choice of the proper candidate, as it is equally violated by both faithful representations.

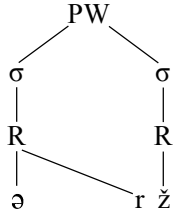
5. Conclusion

In sum, the following ranking of constraints has been established for Standard Ukrainian in the course of this analysis:

(38) Max_{Seg}, Dep_{Seg}, VC, Align-R >> ObsOns, Ons >> SSG >>
SL, Align-L, NoComplCoda, NoCoda >> NoComplOns

[12] Feet are irrelevant in Slavic languages.

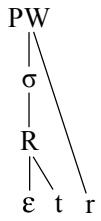
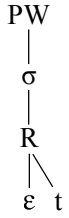
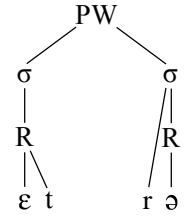
(44) Input: //ržɛ//

	Max_{Seg}	Dep_{Seg}	SSG	SL	Align-L(stem,σ)
☞ (a) 				*	*
(b) 			*!		
(c) 	*!				*
(d) 		*!			*

The productive prothesis in south-western dialects of Ukrainian testifies to the existence of a factorial typology involving Dep_{Seg} and Ons. In Standard Ukrainian the former dominates the latter, whereas in south-western dialects the reverse ranking is posited.

It has also been shown that not all consonants violating SSG are treated in the same way. Notably, obstruents are virtually free to violate sonority relations within the syllable; such violations incurred by sonorants are significantly less common and limited to word edges. This discrepancy between sonorants and obstruents is captured in OT in the

(45) Input: //ɛtr//

	Max_{Seg}	Dep_{Seg}	Align-R(stem,σ)	ObsOns	SSG	SL
☞ (a) 				*	*	
(b) 			*!	*		*
(c) 	*!		*	*		
(d) 		*!	*	*		

form of a high-ranked constraint referring exclusively to obstruents and stating that they must appear in onsets. Thus, word-medial clusters of obstruents are subject to onset maximisation. In the case of word-medial clusters of sonorants with falling sonority, such maximisation is proscribed by SSG. Word-medial clusters of obstruents are split only when they exhibit the lack of agreement in voicing, which calls for the universally undominated Voice Constraint. Finally, the discussion of word-initial and word-final extrasyllabic sonorants and their different behaviour with respect to voicing warrants a

claim about their different syllable affiliation. Those sonorants that are transparent to voicing (word-initial) skip the syllable tier and are adjoined directly under the PW node. In contrast, sonorants blocking voice assimilation (word-final) are regularly linked to the syllable node. An OT analysis calls for input-output alignment constraints that refer to both word edges, as well as a constraint militating against the skipping of a prosodic tier (Strict Layer) and SSG. Finally, it is important to emphasize that the *raison d'être* of each of the discussed processes is the syllable structure. OT is capable of capturing that by reference to specific syllable-driven markedness constraints.

REFERENCES

Bethin, Ch.Y. 1987. "Syllable final laxing in Ukrainian". *Folia Slavica* 8. 185–197.
Braxnov, V. M. 1970. *Javyšča asymiljaciji v konsonantyzmi ukrajins'koji movy*. Kiev: Naukova Dumka.
Broselow, E. 1991. "The structure of fricative-stop onsets". Paper presented at Conference for the Organization of Phonological Features, Santa Cruz.
Bulaxovs'kyj, L.A. (ed.). 1951. *Kurs sučasnoji ukrajins'koji movy*. (Vol. 1.) Kiev: Radjans'ka Škola.
Clements, G. 1985. "The geometry of phonological features". *Phonology* 2. 225–252.
Clements, G. and E.V. Hume. 1995. "The internal organization of speech sounds". In Goldsmith, J. (ed.), *Handbook of phonological theory*. Cambridge, MA: Blackwell. 245–306.
Czaplicki, B. 2006. "Laryngeals and velars in Ukrainian". *The Slavonic and East European Review* 1. 1–15.
Jespersen, O. 1904. *Lehrbuch der Phonetik.* Leipzig–Berlin: B.G. Teubner.
Morelli, F. 1999. The phonotactics and phonology of obstruent clusters in Optimality Theory. [Unpublished PhD dissertation, University of Maryland.]
McCarthy, J.J. and A.S. Prince. 1993a. Prosodic morphology: Constraint interaction and satisfaction. [Manusscript, University of Massachusetts, Amherst and Rutgers University.]
McCarthy, J.J. and A.S. Prince. 1993b. Generalized alignment. [Manusscript, University of Massachusetts, Amherst and Rutgers University.]
Nespor, M. and I. Vogel. 1986. *Prosodic phonology.* Dodrecht: Foris.
Perebyjnis, V.S. 1970. *Kil'kisni ta jakisni xarakterystyky systemy fonem sučasnoji ukrajins'koji literaturnoji movy*. Kiev: Naukova Dumka.
Prince, A. and P. Smolensky. 1993. *Optimality Theory*. [Manusscript, Rutgers University and University of Colorado.]
Rubach, J. 1996. "Nonsyllabic analysis of voice assimilation in Polish". *Linguistic Inquiry* 27. 69–110.
Rubach, Jerzy. 1997a. "English syllabification". *Anglica* 7. 65–84.
Rubach, Jerzy. 1997b. "Polish voice assimilation in Optimality Theory". *Rivista di Linguistica* 9. 291–342.
Rubach, J. and G.E. Booij. 1990. "Syllable structure assignment in Polish". *Phonology* 7. 121–158.
Rusanovskij, V.M., M.A. Žovtobrjux, E.G. Horodenskaja and A.A. Hriščenko. 1986. *Ukrainskaja grammatika*. Kiev: Naukova Dumka.
Sawicka, I. 1974. *Struktura grup spółgłoskowych w językach słowiańskich*. Wrocław: Zakład Narodowy im. Ossolińskich.

Selkirk, E. 1982. "The syllable. The structure of phonological representations". In van der Hulst, H. and N. Smith (eds.), *Advances in nonlinear phonology*. (Part II.) Dordrecht: Foris. 337–383.

Selkirk, E. 1984. "On the major class features and syllable theory". In Aronoff, M. and R.T. Oehrle (eds.), *Language sound structure.* Cambridge, MA: MIT Press. 107–136.

Steriade, D. 1994. "Complex onsets as single segments. The Mazateco pattern". In Cole, J. and C. Kisseberth (eds.), *Perspectives in phonology*. Stanford: CSLI Publications.

Ševelov, G.Y. 1979. *A historical phonology of the Ukrainian language*. Heidelberg: Carl.

Toc'ka, N.I. 1981. *Sučasna ukrajins'ka literaturna mova. Fonetyka, orfoepija, hrafika, orfohrafija*. Kiev: Vyšča škola.

Ziłyn'ski, Jan. 1932. *Opis fonetyczny języka ukraińskiego*. Kraków: Polska Akademia Umiejętności.

Žovtobrjux, M.A., A. Kulyk and M. Borys. 1972. *Kurs sučasnoji ukrajins'koji literaturnoji movy*. Kiev: Vyšča škola.